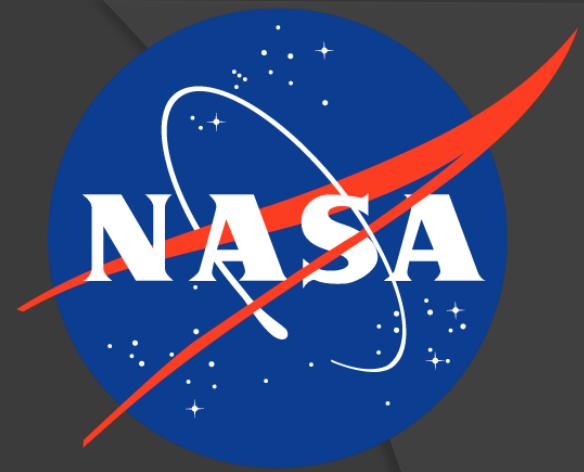


COMPONENTS OF NASA'S DATA ACQUISITION SYSTEM

Fall Internship, 2015

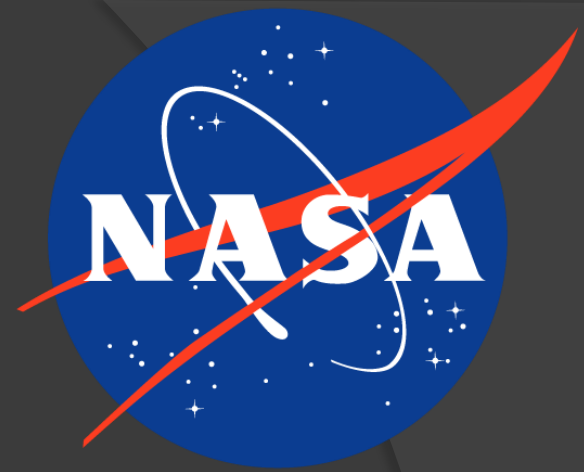
Melanie Schmocker

Overview



- ◉ Context
 - NDAS
- ◉ NOSS
 - Nodes
 - Form Validation
- ◉ NCAL
 - Calibration Report
- ◉ Other
- ◉ Questions

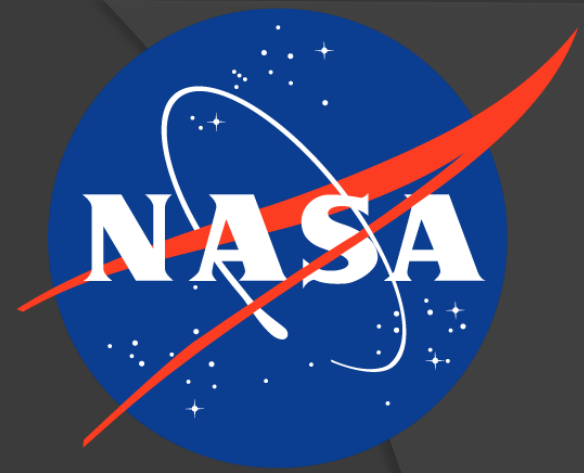
Overview



- ◎ Context
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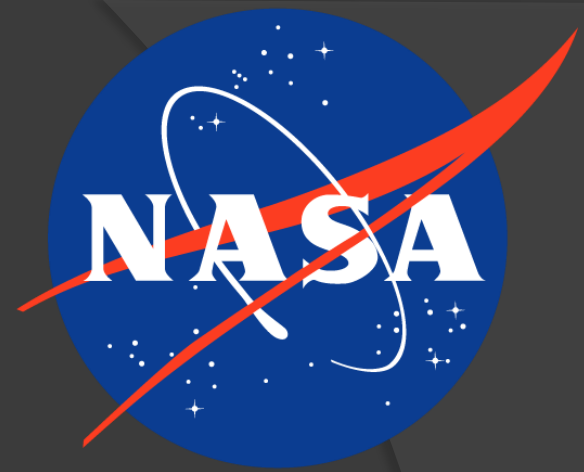
Context

- Stennis Space Center



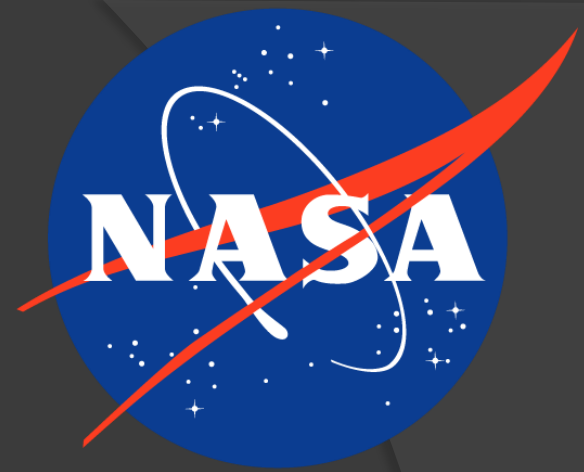
Context

- Stennis Space Center
 - Test rocket engines



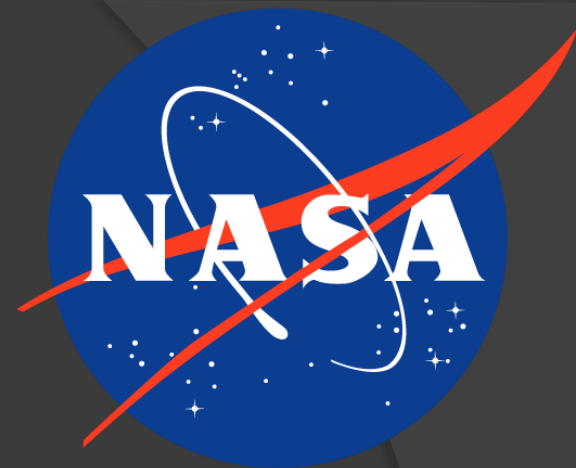
Context

- Stennis Space Center
 - Test rocket engines

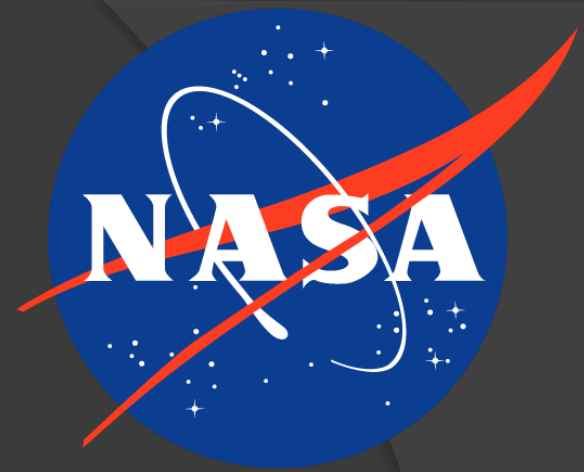


Context

- Stennis Space Center
 - Test rocket engines
- NDAS – NASA's Data Acquisition System

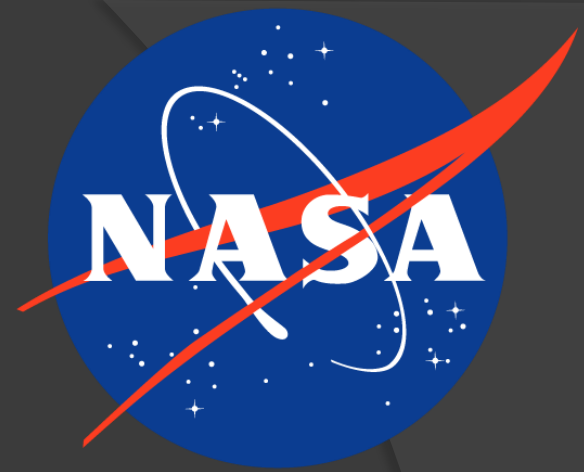


Context



- ◎ Stennis Space Center
 - Test rocket engines
 - ◎ NDAS – NASA's Data Acquisition System which can:
 - Calibrate (NCAL)
 - Record (NLOG)
 - Display (NDIS)
 - Export (NGATE)
- and otherwise process data from tests

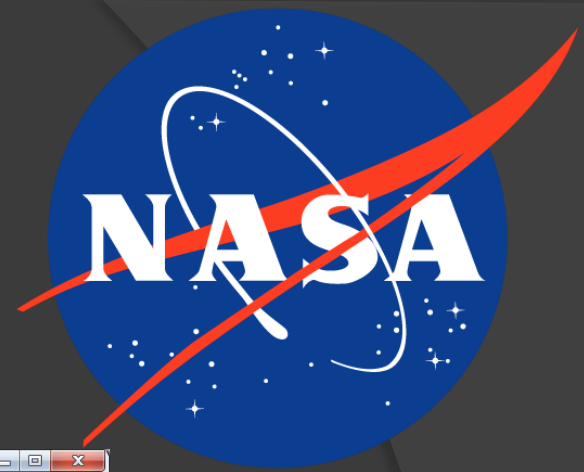
Overview



- ◎ Context
 - NDAS
- ◎ NOSS
 - Nodes
 - Form Validation
- ◎ NCAL
 - Calibration Report
- ◎ Other
- ◎ Questions

NOSS Database

● NASA's One-Stop Shop



Find Node

localhost/noss/web/index.php/nodes/find

NOSS Tests Measurements Nodes Calibration Actions Reports Exports Engineer (Engineer)

Find Node

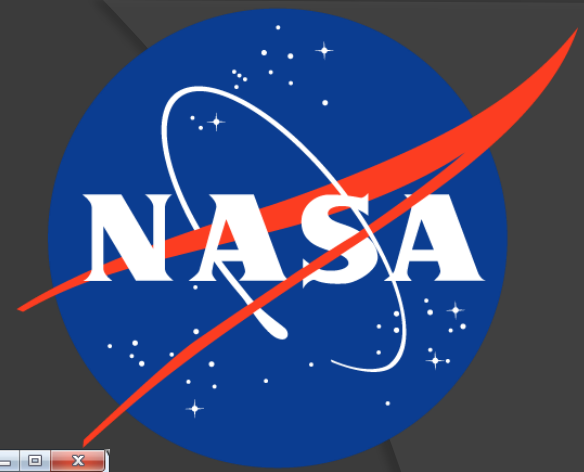
Nodes List Showing 1-25 of 4,901 items.

#	Node Identifier	Node Type	Notes	Status	Inputs	Outputs	Actions
1	Transducer 206	Generic Transducer	NONE	Operational		Transducer 206	
2	Transducer 207	Generic Transducer	NONE	Operational	0		
3	Transducer 208	Generic Transducer	NONE	Operational	0		
4	Transducer 210	Generic Transducer	NONE	Operational		Transducer 210	
5	Transducer 211	Generic Transducer	NONE	Operational		Transducer 211	
6	Transducer 212	Generic Transducer	NONE	Operational	0		
7	Transducer 213	Generic Transducer	NONE	Operational	0		

Yii Debugger Yii 2.0.3 PHP 5.4.31 Status 200 Route nodes/find Log 76 Time 2,765 ms Memory 10.0 MB DB 61 86 ms Asset Bundles 9

NOSS Database

● NASA's One-Stop Shop



Transducer 206

localhost/noss/web/index.php/nodes/update?id=1

NOSS Tests Measurements Nodes Calibration Actions Reports Exports Engineer (Engineer)

Node SERIAL_NUMBER Update

Metadata MODEL_NUMBER

IO

COEFFICIENTS SU_CODE

TYPES

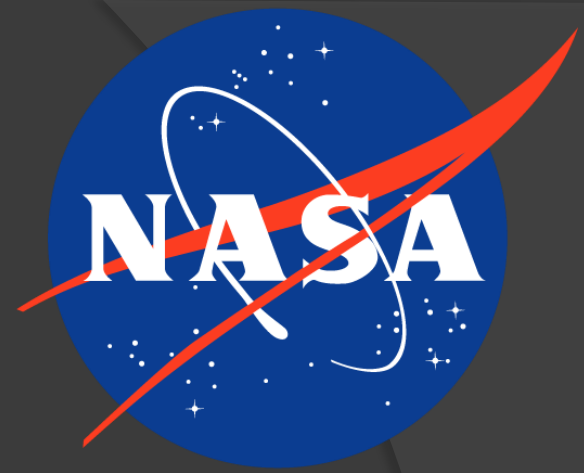
ADDITIONAL_INFO PRECISION_CODE

EQUATION_TYPE

INSTALL_DATE

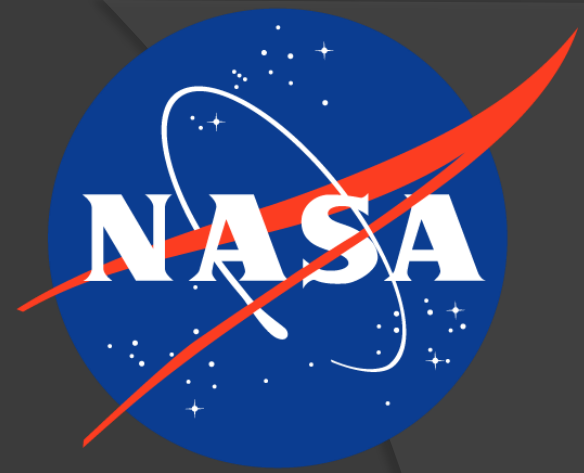
Yii Debugger Yii 2.0.3 PHP 5.4.31 Status 200 Route nodes/update Log 26 Time 1,228 ms Memory 6.2 MB DB 12 14 ms Asset Bundles 7

Nodes and Measurements



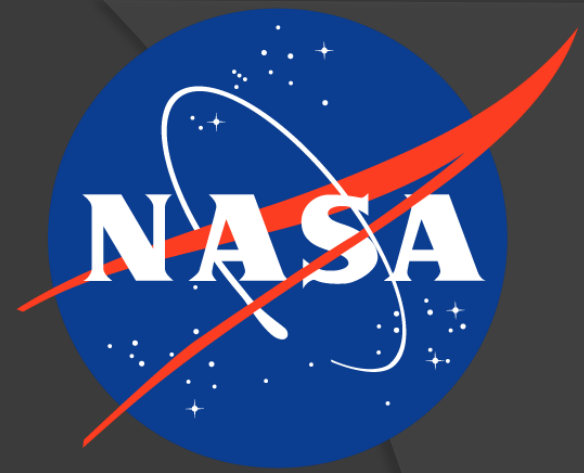
- Each Node represents a piece of hardware on the test stand

Nodes and Measurements



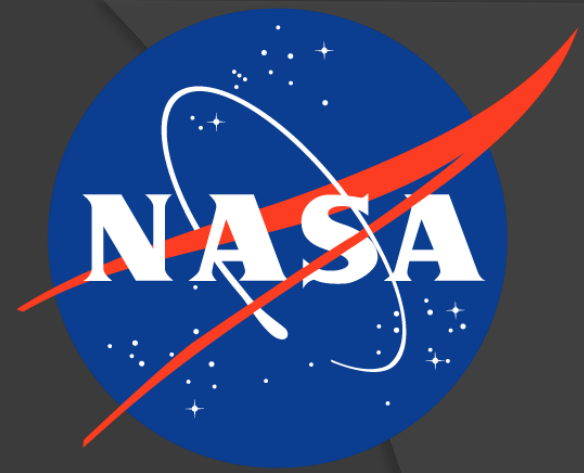
- ⦿ Each Node represents a piece of hardware on the test stand
 - Sensors
 - Filters
 - Digitizers

Nodes and Measurements



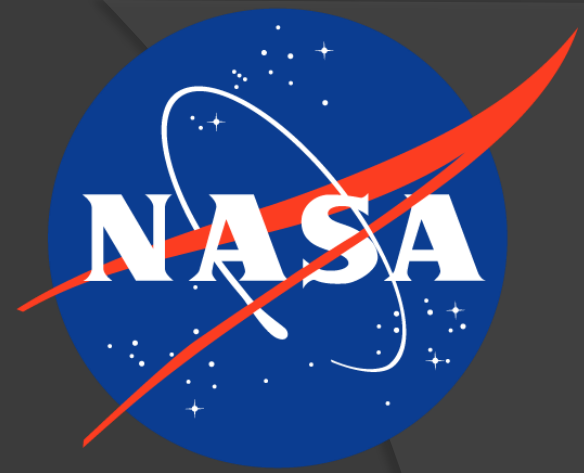
- ⦿ Each Node represents a piece of hardware on the test stand
 - Sensors
 - Filters
 - Digitizers
- ⦿ Measurements are collections of Nodes

Nodes and Measurements



- ⦿ Each Node represents a piece of hardware on the test stand
 - Sensors
 - Filters
 - Digitizers
- ⦿ Measurements are collections of Nodes
 - Represent Nodes that are physically connected

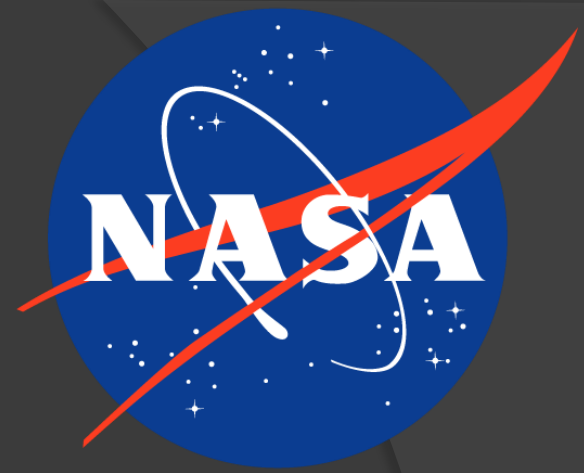
Nodes and Measurements



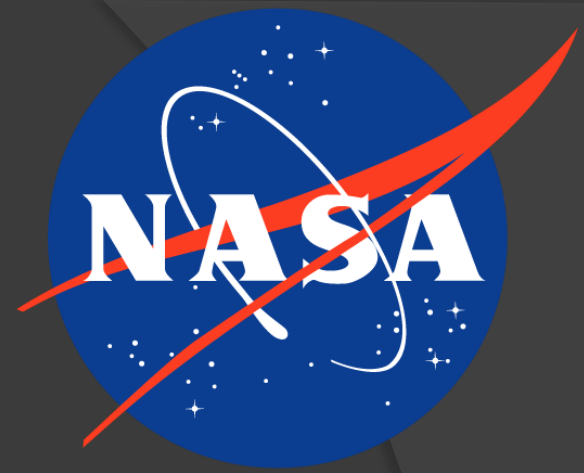
- ⦿ Each Node represents a piece of hardware on the test stand
 - Sensors
 - Filters
 - Digitizers
- ⦿ Measurements are collections of Nodes
 - Represent Nodes that are physically connected
 - Enable intuitive interpretation of data

Adding Nodes

- How to handle new types of hardware?

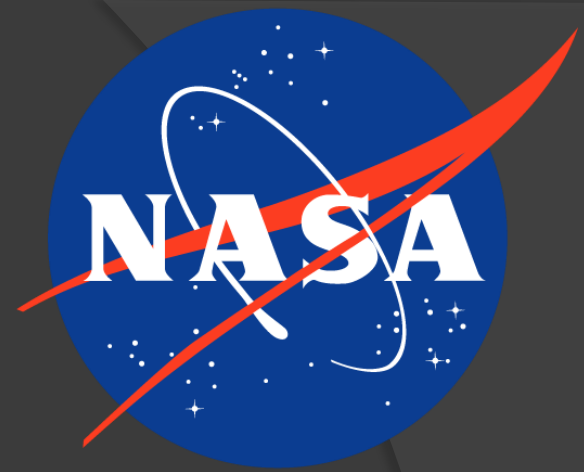


Adding Nodes



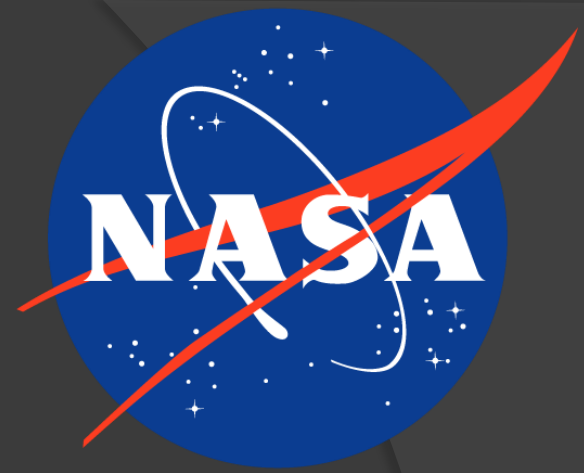
- How to handle new types of hardware?
- Typical database method

Adding Nodes



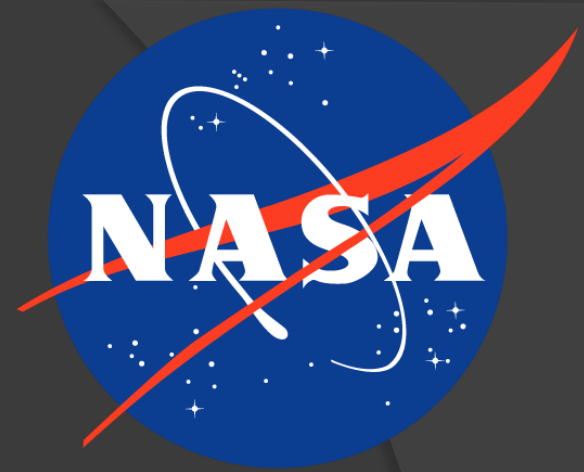
- ⦿ How to handle new types of hardware?
- ⦿ Typical database method
 - Redesign database

Adding Nodes



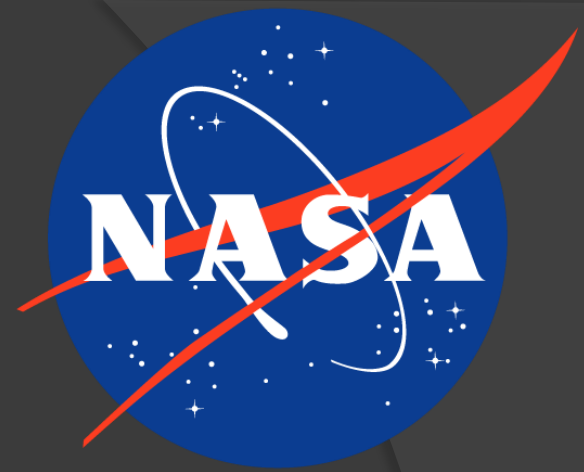
- ⦿ How to handle new types of hardware?
- ⦿ Typical database method
 - Redesign database
- ⦿ NOSS method

Adding Nodes



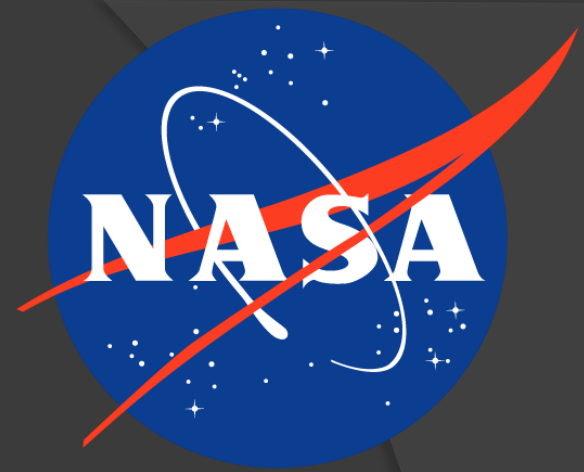
- ⦿ How to handle new types of hardware?
- ⦿ Typical database method
 - Redesign database
- ⦿ NOSS method
 - Nodes stored as XML in database

Adding Nodes



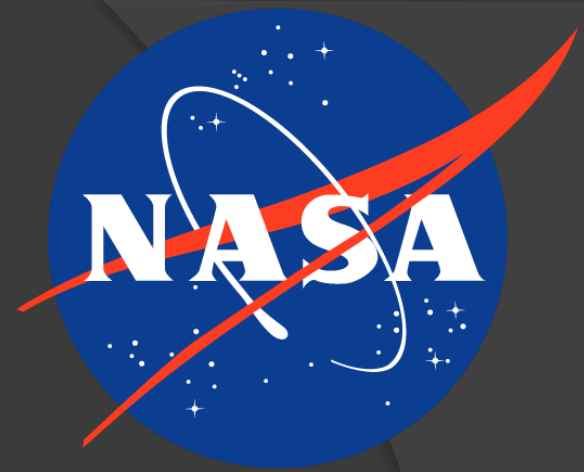
- ⦿ How to handle new types of hardware?
- ⦿ Typical database method
 - Redesign database
- ⦿ NOSS method
 - Nodes stored as XML in database
 - Dynamically creates pages to create/update

Adding Nodes



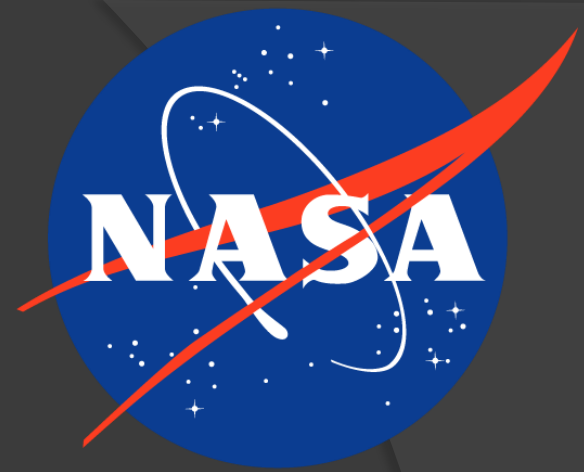
- ⦿ How to handle new types of hardware?
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 - Redesign database
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 - Nodes stored as XML in database
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 - All XML are text, so no redesign necessary

Adding Nodes

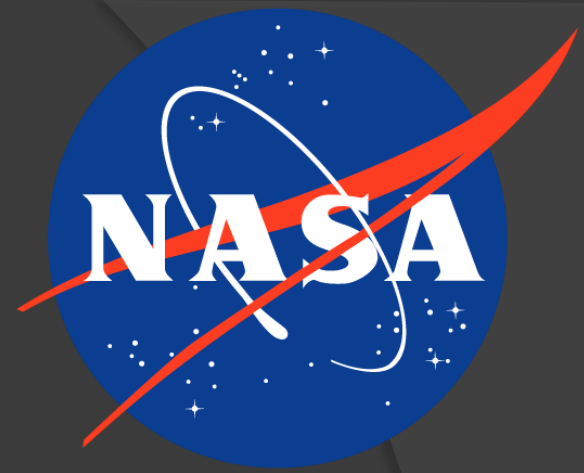


- ⦿ How to handle new types of hardware?
- ⦿ Typical database method
 - Redesign database
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 - Nodes stored as XML in database
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Adding Nodes

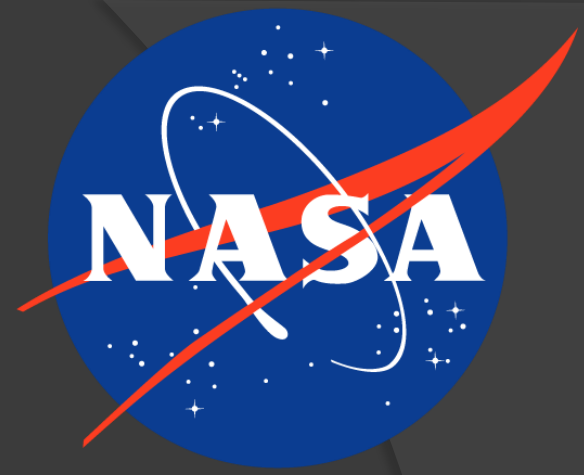


- ⦿ How to handle new types of hardware?
- ⦿ Typical database method
 - Redesign database
- ⦿ NOSS method
 - Nodes stored as XML in database
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Node Form Updates

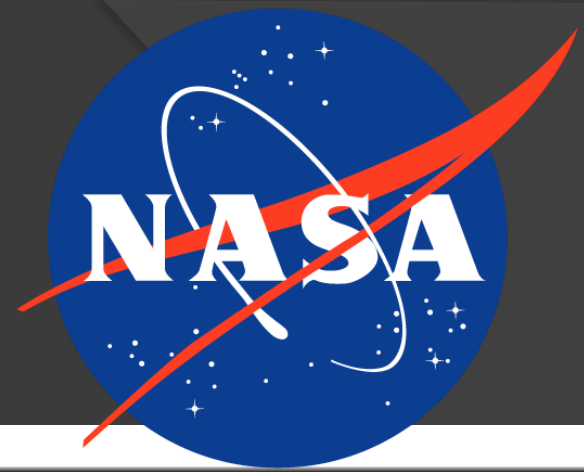
- XSD format



Node Form Updates

- XSD format

XML Schema Definition

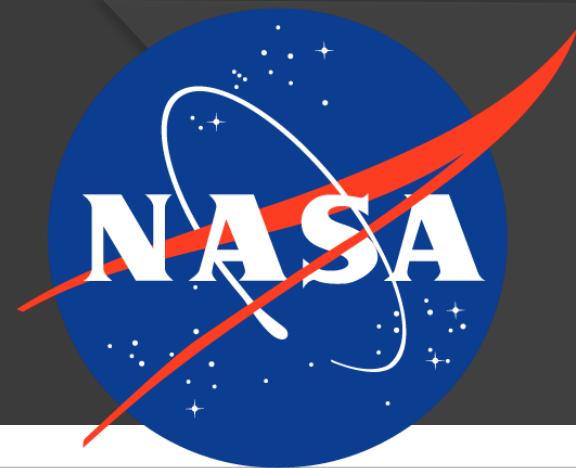


Node Form Updates

● XSD format

XML Schema Definition

```
NIRDTTableMapping.xml Generic_Transducer.xsd
1 <xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" attributeFormDefault="
  "unqualified" elementFormDefault="qualified">
2   ..
3   <xs:element name="GENERIC_TRANSDUCER" type="GenericTransducerType"/>
4   ..
5   <xs:complexType name="IOType">
6     <xs:sequence>
7       <xs:element type="xs:string" name="OUTPUT" maxOccurs="1" minOccurs="1" />
8     </xs:sequence>
9   </xs:complexType>
10  ..
11  <xs:complexType name="CoefficientType">
12    <xs:sequence>
13      <xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A0"/>
14      <xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A1"/>
15      <xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A2"/>
16      <xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A3"/>
17      <xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A4"/>
18      <xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A5"/>
19      <xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A6"/>
20      <xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A7"/>
21    </xs:sequence>
22  </xs:complexType>
23  ..
24  <xs:complexType name="TransducerTypes">
25    <xs:sequence>
26      <xs:element type="xs:string" name="TRANSDUCER_TYPE"/>
27      <xs:element type="xs:float" name="RTP"/>
28      <xs:element type="xs:float" name="RTD_MC_T1"/>
29      <xs:element type="xs:float" name="RTD_MC_T2"/>
```

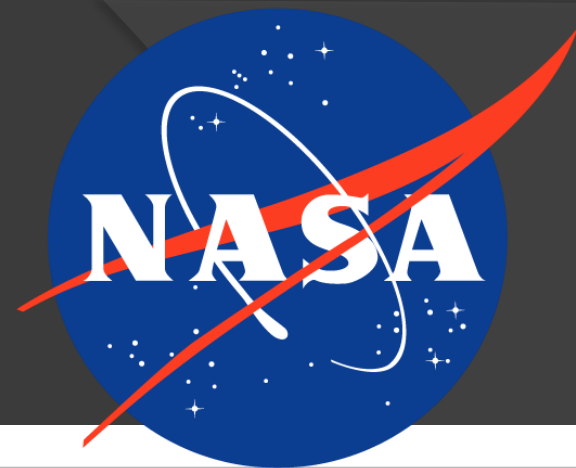


Node Form Updates

● XSD format

- Before me: minimal validations

```
NIRDTTableMapping.xml Generic_Transducer.xsd
1 <xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" attributeFormDefault="
  "unqualified" elementFormDefault="qualified">
2 ..
3 ..<xs:element name="GENERIC_TRANSDUCER" type="GenericTransducerType"/>
4 ..
5 ..<xs:complexType name="IOType">
6 ..<xs:sequence>
7 ..<xs:element type="xs:string" name="OUTPUT" maxOccurs="1" minOccurs="1"
8 ..</xs:sequence>
9 ..</xs:complexType>
10 ..
11 ..<xs:complexType name="CoefficientType">
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13 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A0"/>
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15 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A2"/>
16 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A3"/>
17 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A4"/>
18 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A5"/>
19 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A6"/>
20 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A7"/>
21 ..</xs:sequence>
22 ..</xs:complexType>
23 ..
24 ..<xs:complexType name="TransducerTypes">
25 ..<xs:sequence>
26 ..<xs:element type="xs:string" name="TRANSDUCER_TYPE"/>
27 ..<xs:element type="xs:float" name="RTP"/>
28 ..<xs:element type="xs:float" name="RTD_MC_T1"/>
29 ..<xs:element type="xs:float" name="RTD_MC_T2"/>
```

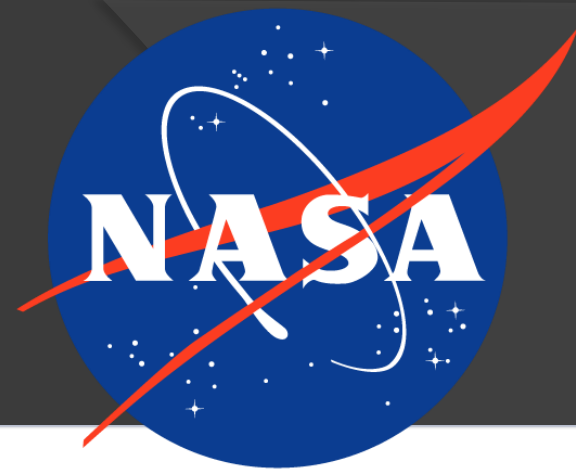


Node Form Updates

● XSD format

- Before me: minimal validations
- My tasks
 - Update XPath references

```
NIRDTTableMapping.xml Generic_Transducer.xsd
1 <xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" attributeFormDefault="
  "unqualified" elementFormDefault="qualified">
2 ..
3 ..<xs:element name="GENERIC_TRANSDUCER" type="GenericTransducerType"/>
4 ..
5 ..<xs:complexType name="IOType">
6 ..<xs:sequence>
7 ..<xs:element type="xs:string" name="OUTPUT" maxOccurs="1" minOccurs="1"
8 ..</xs:sequence>
9 ..</xs:complexType>
10 ..
11 ..<xs:complexType name="CoefficientType">
12 ..<xs:sequence>
13 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A0"/>
14 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A1"/>
15 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A2"/>
16 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A3"/>
17 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A4"/>
18 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A5"/>
19 ..<xs:element type="xs:float" name="ACTUAL_COEFFICIENT_A6"/>
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29 ..<xs:element type="xs:float" name="RTD_MC_T2"/>
```

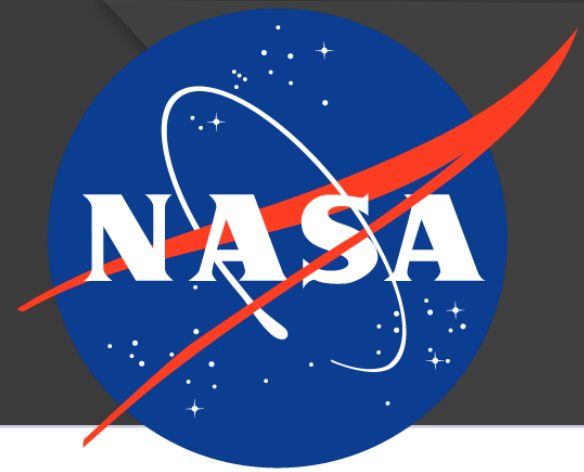


Node Form Updates

● XSD format

- Before me: minimal validation done
- My tasks
 - Update XPath references
 - Enforce all XSD validations in browser form

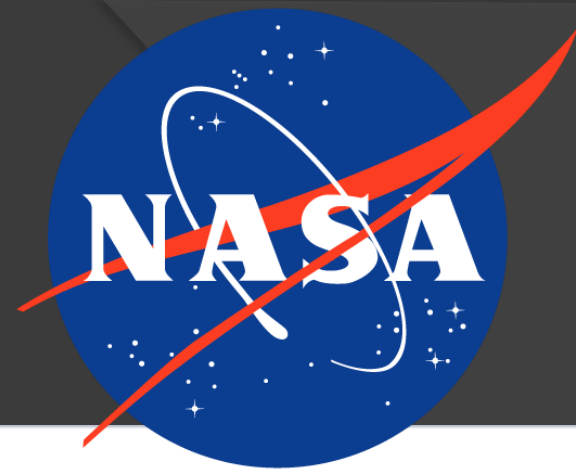
```
demonstration.xsd
44 <xs:complexType name="BaseDemoType">
45   <xs:sequence>
46     <xs:element name="NUMBERS" type="numberType"/>
47     <xs:element name="STRINGS" type="stringType"/>
48     <xs:element name="OTHERS" type="otherType"/>
49   </xs:sequence>
50 </xs:complexType>
51
52
53 <xs:complexType name="numberType">
54   <xs:sequence>
55     <xs:element name="INCLUSIVE_BOUNDARIES_0_TO_100">
56       <xs:simpleType>
57         <xs:restriction base="xs:integer">
58           <!-- restricts acceptable inputs to integers -->
59           <xs:minInclusive value="0"/>
60           <xs:maxInclusive value="100"/>
61           <!-- Allows values between min and max, including the boundaries -->
62         </xs:restriction>
63       </xs:simpleType>
64     </xs:element>
65     <xs:element name="EXCLUSIVE_BOUNDARIES_0_TO_100">
66       <xs:simpleType>
67         <xs:restriction base="xs:float">
68           <xs:minExclusive value="0"/>
69           <xs:maxExclusive value="100"/>
70           <!-- Allows values larger than min and smaller than max -->
71         </xs:restriction>
72       </xs:simpleType>
73     </xs:element>
```



Node Form Updates

- XSD format
 - Restrictions
 - Extensions

```
demonstration.xsd x
44 <xs:complexType name="BaseDemoType">
45   <xs:sequence>
46     <xs:element name="NUMBERS" type="numberType"/>
47     <xs:element name="STRINGS" type="stringType"/>
48     <xs:element name="OTHERS" type="otherType"/>
49   </xs:sequence>
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53 <xs:complexType name="numberType">
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67         <xs:restriction base="xs:float">
68           <xs:minExclusive value="0"/>
69           <xs:maxExclusive value="100"/>
70           <!-- Allows values larger than min and smaller than max -->
71         </xs:restriction>
72       </xs:simpleType>
73     </xs:element>
74   </xs:sequence>
75 </xs:complexType>
```

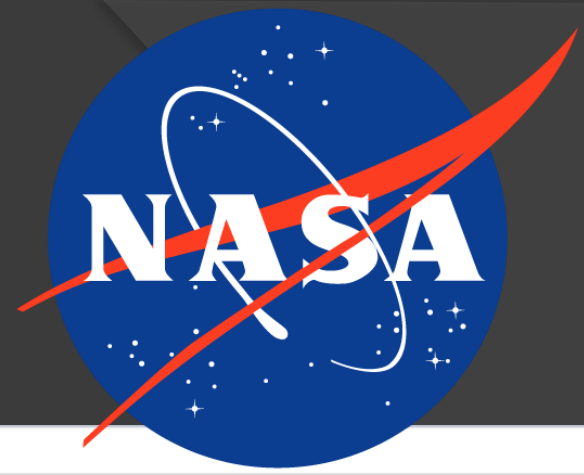



Node Form Updates

● XSD format

- Restrictions
 - Limit values stored
- Extensions

```
demonstration.xsd
44 <xs:complexType name="BaseDemoType">
45   <xs:sequence>
46     <xs:element name="NUMBERS" type="numberType"/>
47     <xs:element name="STRINGS" type="stringType"/>
48     <xs:element name="OTHERS" type="otherType"/>
49   </xs:sequence>
50 </xs:complexType>
51
52
53 <xs:complexType name="numberType">
54   <xs:sequence>
55     <xs:element name="INCLUSIVE_BOUNDARIES_0_TO_100">
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67         <xs:restriction base="xs:float">
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75 </xs:complexType>
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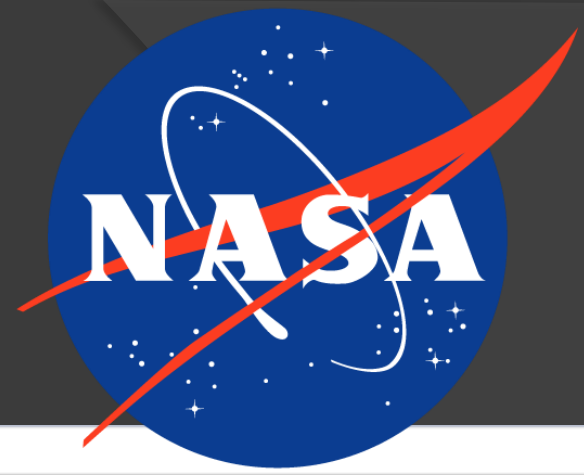


Node Form Updates

● XSD format

- Restrictions
 - Limit values stored
- Extensions
 - Add attributes to XML

```
demonstration.xsd
44 <xs:complexType name="BaseDemoType">
45   <xs:sequence>
46     <xs:element name="NUMBERS" type="numberType"/>
47     <xs:element name="STRINGS" type="stringType"/>
48     <xs:element name="OTHERS" type="otherType"/>
49   </xs:sequence>
50 </xs:complexType>
51
52
53 <xs:complexType name="numberType">
54   <xs:sequence>
55     <xs:element name="INCLUSIVE_BOUNDARIES_0_TO_100">
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66       <xs:simpleType>
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70           <!-- Allows values larger than min and smaller than max -->
71         </xs:restriction>
72       </xs:simpleType>
73     </xs:element>
```



Node Form Updates

● XSD format

- Restrictions
 - Limit values stored
- Extensions
 - Add attributes to XML

● Validations

```
demonstration.xsd
44 <xs:complexType name="BaseDemoType">
45   <xs:sequence>
46     <xs:element name="NUMBERS" type="numberType"/>
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53 <xs:complexType name="numberType">
54   <xs:sequence>
55     <xs:element name="INCLUSIVE_BOUNDARIES_0_TO_100">
56       <xs:simpleType>
57         <xs:restriction base="xs:integer">
58           <!-- restricts acceptable inputs to integers -->
59           <xs:minInclusive value="0"/>
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66     <xs:element name="EXCLUSIVE_BOUNDARIES_0_TO_100">
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74     </xs:element>
75   </xs:sequence>
76 </xs:complexType>
```

Validations

- No input

REGEX_PATTERN

- Invalid input

REGEX_PATTERN

REGEX_PATTERN is invalid. It should match the regex `/^\\s*([a-zA-Z]+\\s*)+[0-9]+\\s*$`

- Valid input

REGEX_PATTERN

Validations

- No input

REGEX_PATTERN

- Invalid input

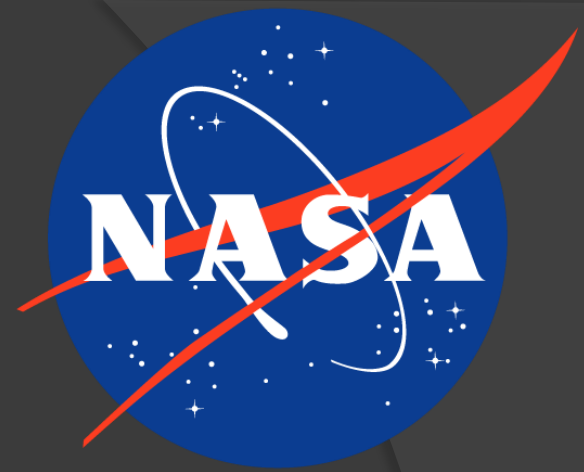
REGEX_PATTERN

Value should be words followed by a number

- Valid input

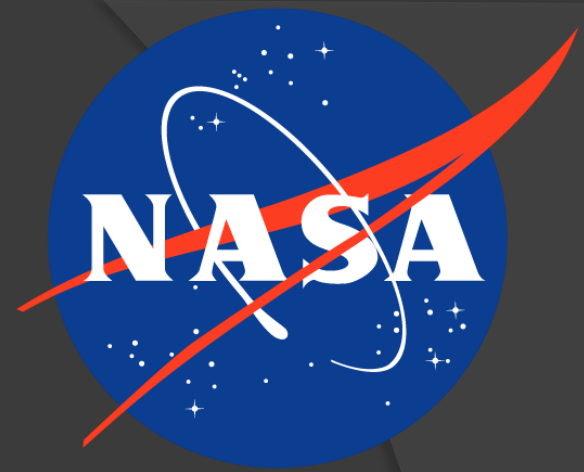
REGEX_PATTERN

Overview



- ◎ Context
 - NDAS
- ◎ NOSS
 - Nodes
 - Form Validation
- ◎ NCAL
 - Calibration Report
- ◎ Other
- ◎ Questions

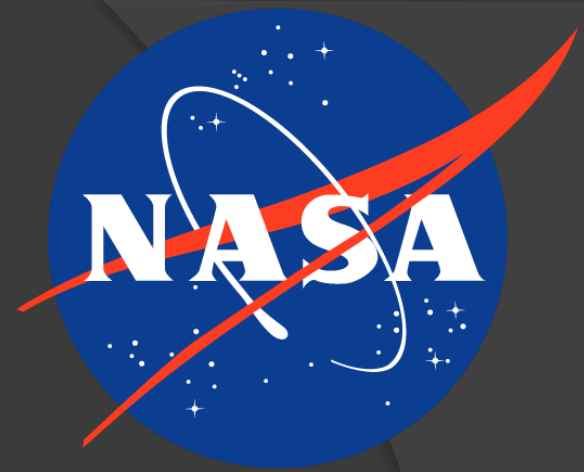
NCAL



- Calibrates Measurements

- May also compare against a trusted prior calibration

NCAL

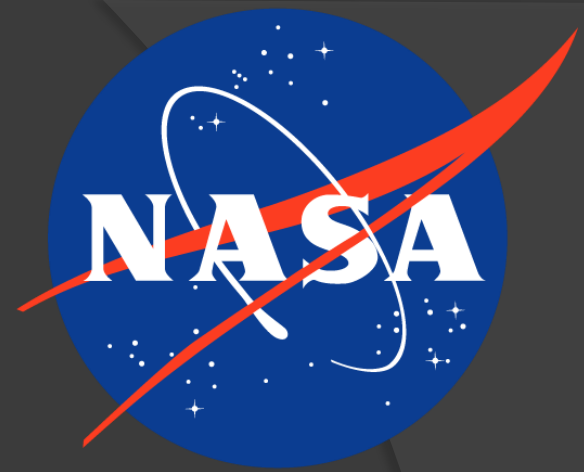


- Calibrates Measurements

- May also compare against a trusted prior calibration

- Produces a Calibration Report

NCAL



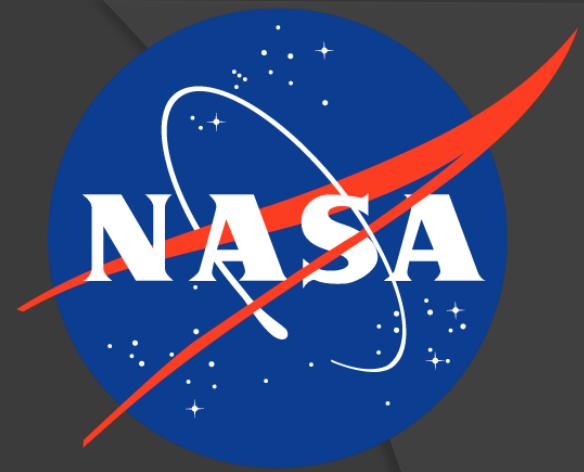
- Calibrates Measurements

- May also compare against a trusted prior calibration

- Produces a Calibration Report

- Sensors calibrated at different points throughout the range of expected values

NCAL



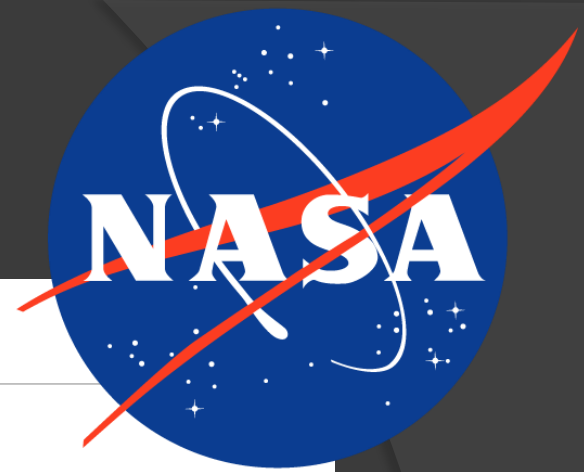
- Calibrates Measurements

- May also compare against a trusted prior calibration

- Produces a Calibration Report

- Sensors calibrated at different points throughout the range of expected values
- Report is HTML but must also be printable

Calibration Report Updates



● Prior format

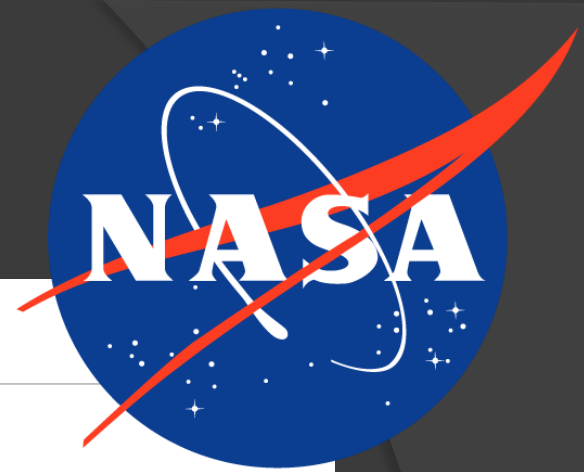
NDAS Daily Cal Report

TEST STAND	
OPERATOR	
CAL DATE	
DATA BASE MDID	
REF CAL DATE	
TEST NUMBER	

This page was created on Thu Nov 12 2015 at 16:10:59

CAL FILE	AMP	MEASUREMENT ID	PASS	PREAMB COUNTS	0 CAL	80 CAL	POSTAMB COUNTS	NCAL C0	NCAL C1	Description
CURRENT	0	CUI-000	0	15 ^{sec}	47	23437	20 ^{sec}	-0.060581 ^{sec}	11.262962 ^{sec}	Test Channel 0
ANCILLARY	1 ^{sec}	PSIG ^{sec}	0 ^{sec}	5 ^{sec}	4 ^{sec}	5 ^{sec}	4 ^{sec}	23420 ^{sec}	0 ^{sec}	
CURRENT	1	CUI-001	0	32767 ^{sec}	84767	84767	32767 ^{sec}	0.000000 ^{sec}	1.000000 ^{sec}	Test Channel 1
ANCILLARY	2 ^{sec}	DegR ^{sec}	0 ^{sec}	0 ^{sec}	0 ^{sec}	0 ^{sec}	0 ^{sec}	0 ^{sec}	0 ^{sec}	
CURRENT	2	CUI-002	0	8319 ^{sec}	8404	8392	8321 ^{sec}	886.795410 ^{sec}	-344.591949 ^{sec}	Test Channel 2
ANCILLARY	A ^{sec}	DegR ^{sec}	0 ^{sec}	195 ^{sec}	187 ^{sec}	154 ^{sec}	159 ^{sec}	-11 ^{sec}	0 ^{sec}	
CURRENT	3	CUI-003	0	2070 ^{sec}	2037	1989	2085 ^{sec}	55.478905 ^{sec}	-84.392159 ^{sec}	Test Channel 3
ANCILLARY	B ^{sec}	PSIG ^{sec}	0 ^{sec}	129 ^{sec}	81 ^{sec}	117 ^{sec}	75 ^{sec}	-47 ^{sec}	0 ^{sec}	
CURRENT	4	CUI-004	0	18783 ^{sec}	18855	18801	18988 ^{sec}	426.630859 ^{sec}	-73.618820 ^{sec}	Test Channel 4
ANCILLARY	A ^{sec}	PSIA ^{sec}	0 ^{sec}	176 ^{sec}	198 ^{sec}	290 ^{sec}	279 ^{sec}	-54 ^{sec}	0 ^{sec}	
CURRENT	5	CUI-005	0	11504 ^{sec}	11554	11517	11548 ^{sec}	393.379669 ^{sec}	-110.711685 ^{sec}	Test Channel 5
ANCILLARY	B ^{sec}	TEST ^{sec}	0 ^{sec}	137 ^{sec}	102 ^{sec}	104 ^{sec}	120 ^{sec}	-36 ^{sec}	0 ^{sec}	
CURRENT	6	CUI-006	0	22042 ^{sec}	21889	22003	21919 ^{sec}	-234.164505 ^{sec}	35.502769 ^{sec}	Test Channel 6
ANCILLARY	A ^{sec}	DegR ^{sec}	0 ^{sec}	158 ^{sec}	228 ^{sec}	177 ^{sec}	170 ^{sec}	113 ^{sec}	0 ^{sec}	
CURRENT	7	CUI-007	1	10383 ^{sec}	84	84	10295 ^{sec}	-332.067383 ^{sec}	-16958.101562 ^{sec}	Test Channel 7
ANCILLARY	B ^{sec}	DegR ^{sec}	0 ^{sec}	98 ^{sec}	4 ^{sec}	5 ^{sec}	118 ^{sec}	0 ^{sec}	0 ^{sec}	
CURRENT	8	CUI-008	1	-32768 ^{sec}	80	80	-32768 ^{sec}	-82.248108 ^{sec}	4518.101074 ^{sec}	Test Channel 8
ANCILLARY	A ^{sec}	DegR ^{sec}	0 ^{sec}	0 ^{sec}	5 ^{sec}	4 ^{sec}	0 ^{sec}	0 ^{sec}	0 ^{sec}	
CURRENT	9	CUI-009	0	602 ^{sec}	640	-1434 ^{sec}	645 ^{sec}	3.381169 ^{sec}	-1.948625 ^{sec}	Test Channel 9
ANCILLARY	B ^{sec}	DegR ^{sec}	0 ^{sec}	91 ^{sec}	120 ^{sec}	142 ^{sec}	103 ^{sec}	-2075 ^{sec}	0 ^{sec}	
CURRENT	10	CUI-010	1	8442 ^{sec}	0	0	-8438 ^{sec}	-1.160327 ^{sec}	15439.156250 ^{sec}	Test Channel 10
ANCILLARY	A ^{sec}	DegR ^{sec}	0 ^{sec}	309 ^{sec}	5 ^{sec}	4 ^{sec}	195 ^{sec}	0 ^{sec}	0 ^{sec}	
CURRENT	11	CUI-011	1	8369 ^{sec}	1	2	8344 ^{sec}	-7.753644 ^{sec}	-12366.498047 ^{sec}	Test Channel 11
ANCILLARY	B ^{sec}	DegR ^{sec}	0 ^{sec}	87 ^{sec}	2 ^{sec}	5 ^{sec}	86 ^{sec}	0 ^{sec}	0 ^{sec}	
CURRENT	12	CUI-012	1	5154 ^{sec}	1	1	-5049 ^{sec}	-42.772984 ^{sec}	96401.343750 ^{sec}	Test Channel 12
ANCILLARY	A ^{sec}	DegR ^{sec}	0 ^{sec}	240 ^{sec}	4 ^{sec}	4 ^{sec}	199 ^{sec}	0 ^{sec}	0 ^{sec}	

Calibration Report Updates



● Prior format

● Refactor HTML

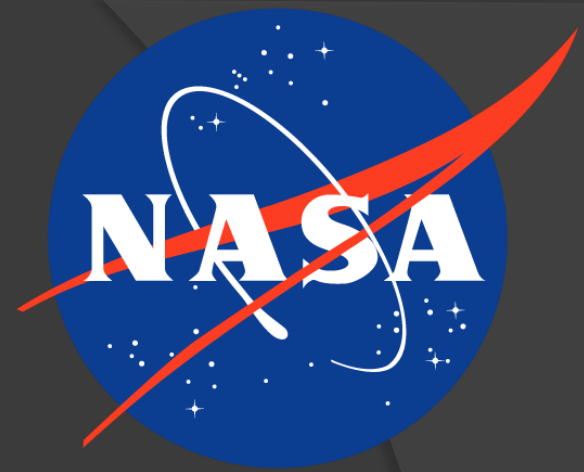
NDAS Daily Cal Report

TEST STAND	
OPERATOR	
CAL DATE	
DATA BASE MDID	
REF CAL DATE	
TEST NUMBER	

This page was created on Thu Nov 12 2015 at 16:10:59

CAL FILE	AMP	MEASUREMENT ID	PASS	PREAMB COUNTS	0 CAL	80 CAL	POSTAMB COUNTS	NCAL C0	NCAL C1	Description
CURRENT	0	CUI-000	0	15 ^{sec}	47	23432	20 ^{sec}	-0.060581 ^{sec}	11.262982 ^{sec}	Test Channel 0
ANCILLARY	1 ^{sec}	PSIG ^{sec}	0 ^{sec}	5 ^{sec}	4 ^{sec}	5 ^{sec}	4 ^{sec}	23420 ^{sec}	0 ^{sec}	
CURRENT	1	CUI-001	0	32767 ^{sec}	84767	84767	32767 ^{sec}	0.000000 ^{sec}	1.000000 ^{sec}	Test Channel 1
ANCILLARY	2 ^{sec}	DegR ^{sec}	0 ^{sec}	0 ^{sec}	0 ^{sec}	0 ^{sec}	0 ^{sec}	0 ^{sec}	0 ^{sec}	
CURRENT	2	CUI-002	0	8319 ^{sec}	8404	8392	8321 ^{sec}	886.795410 ^{sec}	-344.591949 ^{sec}	Test Channel 2
ANCILLARY	A ^{sec}	DegR ^{sec}	0 ^{sec}	195 ^{sec}	187 ^{sec}	154 ^{sec}	159 ^{sec}	-11 ^{sec}	0 ^{sec}	
CURRENT	3	CUI-003	0	2070 ^{sec}	2037	1989	2085 ^{sec}	55.478905 ^{sec}	-84.392159 ^{sec}	Test Channel 3
ANCILLARY	B ^{sec}	PSIG ^{sec}	0 ^{sec}	129 ^{sec}	81 ^{sec}	117 ^{sec}	75 ^{sec}	-47 ^{sec}	0 ^{sec}	
CURRENT	4	CUI-004	0	18783 ^{sec}	18855	18801	18988 ^{sec}	426.630859 ^{sec}	-73.618820 ^{sec}	Test Channel 4
ANCILLARY	A ^{sec}	PSIA ^{sec}	0 ^{sec}	176 ^{sec}	198 ^{sec}	290 ^{sec}	279 ^{sec}	-54 ^{sec}	0 ^{sec}	
CURRENT	5	CUI-005	0	11504 ^{sec}	11554	11517	11548 ^{sec}	393.379669 ^{sec}	-110.711685 ^{sec}	Test Channel 5
ANCILLARY	B ^{sec}	TEST ^{sec}	0 ^{sec}	137 ^{sec}	102 ^{sec}	104 ^{sec}	120 ^{sec}	-36 ^{sec}	0 ^{sec}	
CURRENT	6	CUI-006	0	22042 ^{sec}	21889	22003	21919 ^{sec}	-234.164505 ^{sec}	35.502769 ^{sec}	Test Channel 6
ANCILLARY	A ^{sec}	DegR ^{sec}	0 ^{sec}	158 ^{sec}	228 ^{sec}	177 ^{sec}	170 ^{sec}	113 ^{sec}	0 ^{sec}	
CURRENT	7	CUI-007	1	10383 ^{sec}	84	84	10295 ^{sec}	-332.067383 ^{sec}	-16958.101562 ^{sec}	Test Channel 7
ANCILLARY	B ^{sec}	DegR ^{sec}	0 ^{sec}	98 ^{sec}	4 ^{sec}	5 ^{sec}	118 ^{sec}	0 ^{sec}	0 ^{sec}	
CURRENT	8	CUI-008	1	-32768 ^{sec}	80	80	-32768 ^{sec}	-82.248108 ^{sec}	4518.101074 ^{sec}	Test Channel 8
ANCILLARY	A ^{sec}	DegR ^{sec}	0 ^{sec}	0 ^{sec}	5 ^{sec}	4 ^{sec}	0 ^{sec}	0 ^{sec}	0 ^{sec}	
CURRENT	9	CUI-009	0	602 ^{sec}	640	-1434 ^{sec}	645 ^{sec}	3.381169 ^{sec}	-1.948625 ^{sec}	Test Channel 9
ANCILLARY	B ^{sec}	DegR ^{sec}	0 ^{sec}	91 ^{sec}	120 ^{sec}	142 ^{sec}	103 ^{sec}	-2075 ^{sec}	0 ^{sec}	
CURRENT	10	CUI-010	1	8442 ^{sec}	0	0	-8438 ^{sec}	-1.160327 ^{sec}	15439.156250 ^{sec}	Test Channel 10
ANCILLARY	A ^{sec}	DegR ^{sec}	0 ^{sec}	309 ^{sec}	5 ^{sec}	4 ^{sec}	195 ^{sec}	0 ^{sec}	0 ^{sec}	
CURRENT	11	CUI-011	1	9369 ^{sec}	1	2	9344 ^{sec}	-7.753644 ^{sec}	-12366.498047 ^{sec}	Test Channel 11
ANCILLARY	B ^{sec}	DegR ^{sec}	0 ^{sec}	87 ^{sec}	2 ^{sec}	5 ^{sec}	86 ^{sec}	0 ^{sec}	0 ^{sec}	
CURRENT	12	CUI-012	1	5154 ^{sec}	1	1	-5049 ^{sec}	-42.772984 ^{sec}	96401.343750 ^{sec}	Test Channel 12
ANCILLARY	A ^{sec}	DegR ^{sec}	0 ^{sec}	240 ^{sec}	4 ^{sec}	4 ^{sec}	199 ^{sec}	0 ^{sec}	0 ^{sec}	

Calibration Report Updates



- Prior format
- Refactor HTML
- Add interactive data

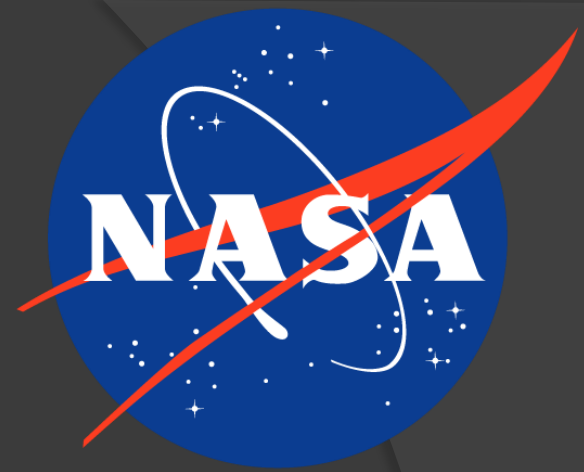
ANCILLARY	1 ^{EQ}	PSIG ^{UT}	0 ^{GT}	5 ^{N_PRE}	4 ^{N_B}	5 ^{N_80}	4 ^{N_PST}	23420 ^{SPC}	0 ^{SPB}	
CURRENT	1	CUI-001	0	32767 ^{PRE}	32767 ⁹	32767 ⁸⁰	32767 ^{PST}	0.000000 ^{CO}	1.000000 ^{C1}	Test Channel 1
ANCILLARY	2 ^{EQ}	DegR ^{UT}	0 ^{GT}	0 ^{N_PRE}	0 ^{N_B}	0 ^{N_80}	0 ^{N_PST}	0 ^{SPC}	0 ^{SPB}	
CURRENT	2	CUI-002	0	8319 ^{PRE}	8404 ⁹	8392 ⁸⁰	8321 ^{PST}	886.795410 ^{CO}	-344.591949 ^{C1}	Test Channel 2
ANCILLARY	A ^{EQ}	DegR ^{UT}	0 ^{GT}	195 ^{N_PRE}	187 ^{N_B}	154 ^{N_80}	159 ^{N_PST}	-11 ^{SPC}	0 ^{SPB}	
CUR							85 ^{PST}	55.478905 ^{CO}	-84.392159 ^{C1}	Test Channel 3
ANCI							N_PST	-47 ^{SPC}	0 ^{SPB}	
CUR							988 ^{PST}	426.630859 ^{CO}	-73.618820 ^{C1}	Test Channel 4
ANCI							N_PST	-54 ^{SPC}	0 ^{SPB}	
CUR							548 ^{PST}	393.379669 ^{CO}	-110.711685 ^{C1}	Test Channel 5
ANCI							N_PST	-36 ^{SPC}	0 ^{SPB}	
CUR							919 ^{PST}	-234.164505 ^{CO}	35.502769 ^{C1}	Test Channel 6
ANCI							N_PST	113 ^{SPC}	0 ^{SPB}	
CUR							295 ^{PST}	-332.067383 ^{CO}	-16958.101562 ^{C1}	Test Channel 7
ANCI							N_PST	0 ^{SPC}	0 ^{SPB}	
CURRENT	8	CUI-008	1	-32768 ^{PRE}	59 ⁹	60 ⁸⁰	-32768 ^{PST}	-82.248108 ^{CO}	4518.101074 ^{C1}	Test Channel 8
ANCILLARY	A ^{EQ}	DegR ^{UT}	0 ^{GT}	0 ^{N_PRE}	5 ^{N_B}	4 ^{N_80}	0 ^{N_PST}	0 ^{SPC}	0 ^{SPB}	
CURRENT	9	CUI-009	0	602 ^{PRE}	640 ⁹	-1434 ⁸⁰	645 ^{PST}	3.381169 ^{CO}	-1.948625 ^{C1}	Test Channel 9
ANCILLARY	B ^{EQ}	DegR ^{UT}	0 ^{GT}	91 ^{N_PRE}	120 ^{N_B}	142 ^{N_80}	103 ^{N_PST}	-2075 ^{SPC}	0 ^{SPB}	

CUI-008

	CAL 0	CAL 10	CAL 20	CAL 30	CAL 40	CAL 50	CAL 60	CAL 70	CAL 80
CURRENT	59	59	60	60	60	60	60	60	60
CURRENT NOISE	5	5	4	4	5	5	4	4	4

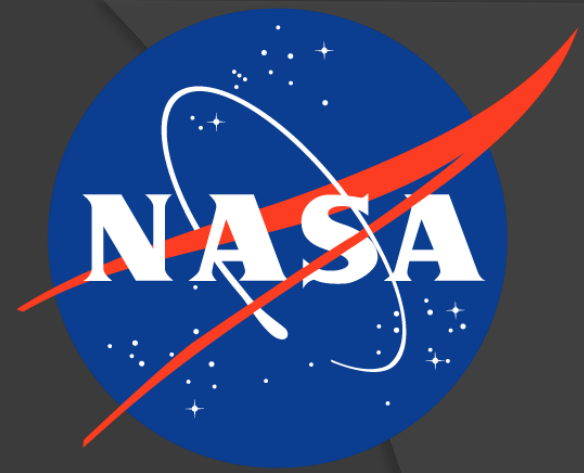
[Close](#)

Overview



- ◎ Context
 - NDAS
- ◎ NOSS
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 - Form Validation
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- ◎ Other
- ◎ Questions

Overview



- ◎ Context
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Thank You

